the continuity of the jet. He finds that air or oxygen have no effect when quite dry.—Temperature of the electrodes of mercury arc lamps, by L. Arons. In the arc lamp with mercury electrodes, devised by Arons, the anode is the hotter, and gradually distils over into the kathode, which is flickering and turbulent. Mercury is condensed on the walls of the vacuum tube, which are easily obscured.—Deflection of kathode rays, by W. Kaufmann and E. Aschkinass. The authors determined the deflection produced in kathode rays by a narrow field due to condenser plates mounted in a tube crossing the vacuum tube at right angles. They found that the amount of deflection observed is strictly in accordance with the projection hypothesis of kathode rays as against the German wave hypothesis.—Magnetic deflection of kathode rays, by W. Kaufmann. The above result led the author to redetermine the ratio *e/m* of the charge of the projected particles to its mass, by a close study of the magnetic field deflecting the ray. It was found to be $1{\cdot}77 \times 10^7$ instead of 10^7.—Kathode rays, by E. Wiedemann and G. C. Schmidt. There are two distinct kinds of kathode rays, which proceed from a point in the form of a solid cone and of a hollow cone respectively, producing on the wall of the tube a patch or a ring. The authors studied these two species under the simplest conditions. They placed a knob, forming the terminal of a Lecher secondary wire, against an exhausted glass sphere without electrodes. A hollow cone proceeded from a point in the sphere next to the knob, whose angle varied with the exhaustion, the size of the sphere, and the curvature of the electrode, increasing as they increased.—Electric observations by balloon, by R. Börnstein. The balloon offers the best means of determining the true potential at any point in the atmosphere, but the charge of the balloon itself is a source of error. This may be eliminated by employing three collectors for three successive points below the balloon, and only about 2 m. distant from each other. If the decrease of potential is uniform, the charge of the balloon is zero. Otherwise, the charge is easily calculated from the observed decrements.—Thermodynamics of luminescence, by K. Wesendonck. A luminescent body is capable of imparting heat to a body warmer than itself. This does not contradict the second law of thermodynamics, as luminescence is not ordinary thermal radiation.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 16, 1897.—"The Comparative Chemistry of the Suprarenal Capsules." By B. Moore, M.A., and Swale Vincent, M.B.

In this paper it is shown that the "paired bodies" of Elasmobranch fishes contain the same chromogen as the medulla of the suprarenal capsules of mammals. In previous papers Vincent had shown not only that the "paired bodies" bear a close resemblance histologically to mammalian medulla, but that they contain a substance which constricts arterioles and raises blood pressure in a similar manner to mammalian medulla.

From the chemical point of view Moore had further shown that this active substance is closely associated with a chromogen also found only in the suprarenal medulla. The active material and chromogen are not, however, identical, for the activity may be destroyed without destroying the chromogen by allowing the material to stand for seven to ten days in strong alcohol. Moore hence supposes that the active material has a complex molecule which is decomposed by the alcohol, and that the chromogenic properties are attached to a group in this molecule which is unattacked in the decomposition.

The colour reactions of the chromogen show that it contains an ortho-dihydroxy-benzene nucleus; thus, it gives a deep green coloration with ferric chloride, and reduces silver nitrate in the cold. Besides these tests, it gives a rose-red colour with alkalis and free halogens and other reactions, which show that it is a strong reducing agent.

Using these colour reactions as tests the chromogen was sought for in extracts of the paired bodies of Elasmobranchs (*Scyllium canicula*), and was found to be present in abundance. It was also shown that no chromogen is present in the inter-renal of Elasmobranchs, which, according to Vincent, corresponds to the cortex of the suprarenal of mammals.

Thus, additional evidence is furnished that the paired bodies correspond to mammalian medulla, while the inter-renal does not resemble medulla and is probably cortex, as suggested by Vincent.

"On a Method of determining the Reactions at the Points of Support of Continuous Beams." By George Wilson, M.Sc., Demonstrator in Engineering in the Whitworth Laboratory of the Owens College, Manchester.

The solution given in this paper differs from those of Bresse, Clapeyron, and Heppel, insomuch that the reactions at the points of support are considered as the unknown quantities to be determined, instead of the bending moments over the piers.

It is shown that by considering the continuous beam as a beam supported at each end and under the action of the given loading acting downwards, and the intermediate supports considered as unknown concentrated loads acting upwards, and equating the deflection at any intermediate point of support caused by the former loading to that caused by the several intermediate reactions treated as concentrated loads, the following series of equations is obtained, viz.:—

$$\begin{aligned} N_1 &= R_1 n_1' + R_2 n_1'' + R_3 n_1''' + \ldots \\ N_2 &= R_1 n_2' + R_2 n_2'' + R_3 n_2''' + \ldots \\ &\quad \text{\&c.} \qquad\qquad \text{\&c.} \end{aligned}$$

Where R with the correct suffix is the reaction at any intermediate point of support, and N and *n* with their suffixes are quantities depending on the dimensions of the beam and the loading.

The quantities *n* are constant and need only be determined once, whilst the value of N changes with the position and magnitude of the live load. A method of determining these constants when the cross section of the beam is variable, is given; when the cross section is uniform, the equations can be written down at once.

The elevation or depression of the supports from any cause affects the values of R, the alterations in which can be determined by means of the above equations when the amount of the elevation or depression is known.

An example is appended to show the application of the method.

Geological Society, December 15, 1897.—Dr. Henry Hicks, F.R.S., President, in the chair.—On the Pyromerides of Boulay Bay, Jersey, by John Parkinson. After briefly noticing the literature of the subject, the author described the altered rhyolites of Boulay Bay. One variety, the commonest, is of a dark red colour, showing flow-structure; another is porphyritic; a third, near the centre of the Bay, has a pale greenish matrix enclosing fragments, which, however, are due to flow-brecciation. Large pyromerides occur in two localities: in the more interesting, that north of the jetty, the structure of the rock indicates either a very peculiar magmatic differentiation *in situ* or (more probably) the mixture of two magmas differing in their stage of consolidation. From study of a series of specimens of the pyromeridal rock, the author arrived at the following conclusions: (1) The rock shows marked flow-structure and at times bands which indicate a slight difference in its composition, the latter tending to assume a moniliform outline. In such the microscopic structure corresponds with that of the pyromerides, and exhibits traces of radial crystallisation. (2) These afford a passage into somewhat oval pyromerides, with rather tapering ends and irregularly mammillated surfaces. (3) From these sometimes a single one seems to be thrown off, while lines of pyromerides or little lumps of similar material are scattered about the matrix. (4) Many of the pyromerides are solid throughout; others have a central cavity filled with quartz.—On the exploration of Ty Newydd Cave near Tremeirchion, North Wales, by the Rev. G. C. H. Pollen. In November 1896 a Committee was formed, consisting of Dr. H. Hicks, Dr. H. Woodward, and the author, for the purpose of exploring this cavern, which is situated in the same ravine on the east side of the Vale of Clwyd as the well-known caverns of Ffynnon Beuno and Cae Gwyn, explored about twelve years ago by Dr. H. Hicks and Mr. E. B. Luxmoore. Grants have been made by the Royal Society and by the Government Grant Committee for the purpose of carrying on the explorations; and though a considerable time must elapse before the work is completed, the results already obtained are of importance. The cavern had been in part broken into by quarrying operations, but the chambers and tunnels were completely filled up with more or less stratified deposits, and had remained entirely untouched. Although the ground above the cavern is strewn over with drift and erratics from the north and from the central areas of Wales, not a fragment of anything but immediately local material has been discovered in the cavern itself, showing clearly that the deposits in the cavern had been carried in by water before the northern and western ice had reached this area. The work has been carried on almost continuously throughout the year, and most of the material has been removed for a distance of over 60 feet from the entrance. The height of the cavern above sea-level is 420 feet, or about 20 feet above the floor of the Cae Gwyn Cave. The following points appear to the author to be now fully established: (1) The material in the Ty Newydd Cave, as in the lower parts of those of Ffynnon Beuno and Cae Gwyn, is of purely local origin. Of this he can speak with confidence, as the question was before him from the beginning and the gravels were examined with minute care for erratics. (2) This local deposit is of earlier date than the boulder clay with western and northern drift. This was proved by the finding of granite- and felsite-boulders abundantly at higher levels and over the cave, and in one case filling the upper part of one of the fissures communicating from above with the cavern. (3) The occurrence of the tooth of a large mammal (*Rhinoceros*) in the lower part of the cave shows that the animal was contemporary with, or of earlier date than the infilling of the cavern by the local drift.

Chemical Society, December 15, 1897.—Prof. Dewar, President, in the chair.—Prof. F. R. Japp delivered the Kekulé Memorial Lecture (see p. 180)—December 16, 1897.—Prof. Dewar, President, in the chair.—The following papers were read:—Stereochemistry of unsaturated compounds. Part i. Esterification of substituted acrylic acids, by J. J. Sudborough and L. L. Lloyd. The authors have made experiments on the esterification of many cinnamic acids and other derivatives of acrylic acid; the acids were boiled under fixed conditions with methylic alcohol solutions of hydrogen chloride, and the quantity of methylic salt formed was subsequently determined. Several rules governing the speed and course of esterification are formulated.—Formation and hydrolysis of esters, by J. J. Sudborough and M. E. Feilmann. The authors conclude that in the conversion of an acid into its ester by the action of an alcohol, either with or without hydrogen chloride, the rate of esterification is determined by two factors, namely (1) the configuration of the acid or the close proximity of substituting groups to the carboxyl group, and (2) the strength of the acid as determined by its affinity constant. The same two factors operate in determining the rate of hydrolysis of the ester.—A new method of determining freezing points in very dilute solution, by M. Wildermann.—A possible basis of generalisation of isomeric changes in organic compounds, by A. Lapworth. The author points out that many isomeric changes, hitherto regarded as of dissimilar types, may be formulated as special cases of a general form, expressible by the reversible equation $R_\alpha M . R_\beta : R_\gamma \rightleftarrows R_\alpha : R_\beta . R_\gamma M$; a labile group M moves from an α to a γ position, the necessary rearrangement of single and double bindings taking place between the three atoms, R_α, R_β and R_γ. By the aid of this general formula and its extended forms the author is able to explain a large number of cases of desmotropy, tautomerism and isomeric change.

DUBLIN.

Royal Dublin Society, December 22, 1897.—Prof. G. F. Fitzgerald, F.R.S., in the chair.—Prof. Thomas Preston read a paper on the radiation of light in a magnetic field. The author described how he had been led to apply photography to the study of the effect (recently discovered by Prof. Zeeman) produced by a strong magnetic field on the radiation from a source of light placed in it. The photographs were projected on a screen, and they rendered all the effects described by Prof. Zeeman clearly visible to a large audience (see p. 173).—Prof. J. Joly, F.R.S., then read a note on a theory of sun-spots. If at some level in the photosphere the temperature falls below the critical temperature of the elements present, and the pressure is sufficient, a precipitation of liquid will result; and it is suggested such a precipitated flood of liquid matter, supported on gaseous matter of higher density, would give rise to the appearances presented by a sun-spot. If the liquid is opaque, it will look darker than the surrounding photosphere. The reflection of the photosphere at the edge and the inrush of gaseous matter over the cooler area will, it is believed, explain the appearance of the penumbra. The re-evaporation of the liquid constitutes the disappearance of the spot. On this view the sun-spot constitutes the first beginning of a change of state in the sun visible to us.

PARIS.

Academy of Sciences, December 20, 1897.—M. A. Chatin in the chair.—The Secretary informed the Academy of the loss it had sustained through the recent death of M. Brioschi, of Milan.—Observations relative to the coffins of Voltaire and of Rousseau, opened December 18, 1897, by M. Berthelot.—Determination of the absolute coordinates of the stars, and also of the latitude, by means of meridian instruments. General method for the solution of these problems, by M. Lœwy.—On the periods of double integrals of algebraic functions, by M. Emile Picard.—Comparison of the thermogenetic or dynamogenetic power of simple food-stuffs with their nutritive value, by M. A. Chauveau. A considerable difference exists between the isoenergetic and isotrophic weights of sugar and fat in the case of a working subject. The isoglycogenetic and isotrophic powers are practically identical.—On those cases of the problem of three bodies (and of *n* bodies) in which two of them collide at the end of a finite time, by M. Painlevé.—On a special method of circumzenithal observations, by M. Ch. Rouget. A further study of the method described in a previous note.—On a particular conjugate net of certain surfaces derived from surfaces of the second order, by M. S. Mangeot.—On Taylor's series, by M. Eug. Fabry.—On the isothermal and adiabatic transformations of true gases; determination of the ratio of the two specific heats, by M. A. Leduc.—On an apparatus permitting of the separation of simple radiations in close proximity, by M. Maurice Hamy. The method is based upon the principle of interference.—Ebullioscopy of some salts in ethereal solution, by M. R. Lespieau. Results are given for uranyl nitrate and the chlorides of mercury, iron, zinc, and antimony.—On cerium, by M. Boudouard. A reply to criticisms on a former paper by the author.—On the duration of the phosphorescent power of sulphide of strontium, by M. José Rodriguez Mourelo. Experiments on sulphide of strontium prepared by different methods show that those specimens which exhibit the greatest intensity of phosphorescence are also those in which the property is most quickly developed and is preserved for the longest time.—Volumetric estimation of antimony, by M. H. Causse. The new method proposed is an iodometric one, depending upon the liberation of iodine from iodic acid by antimonious oxide.—Difference between nitroso-substitution derivatives according as the NO group is directly connected with carbon or with nitrogen, by MM. Camille Matignon and Deligny. A thermochemical paper.—A colour reaction of ordinary aldehyde, by M. Louis Simon. A blue colour is produced on the addition of solutions of trimethylamine and of nitro-prussiate of sodium. The reaction is not given by other aldehydes.—Action of piperidine upon carbonic ethers of phenols; formation of aromatic urethanes, by MM. Cazeneuve and Moreau.—On two Lepidoptera destructive to the sugar-cane in the Mascarene Isles, by M. Edmond Bordage. The author endeavours to clear up the confusion which has arisen as to the history and nomenclature of two species, the larvæ of which are known as "borers."—On the nuclear value of the *central body* of bacteria, by MM. J. Kunstler and P. Busquet.—On extra-liberian cribriform tissue and extra-ligneous vascular tissue, by M. E. Perrot.—On potato rot, by M. E. Roze. An account of the nature and causes of the various changes to which the tubers are liable after gathering.—The composition of oat, wheat, and rye straw, by M. Balland. The results of analyses show no difference between the three varieties of straw, which contain only trifling quantities of nutritive material. Short and leafy straw is to be preferred for the food of horses, and long straw for their litter.—On the presence of beds containing *Planorbis pseudo-ammonius* and *Bulimus Hopei* in the neighbourhood of Sabarrat and Mirepoix (Ariège), by M. G. Vasseur.—Influence of sub-nitrate of bismuth upon the "hardening" of cider, by MM. Leon Dufour and Daniel. The presence of the salt greatly retards the development of acidity. Its addition is recommended in the proportion of 10 grams per hectolitre (0·01 per cent.).—On the estimation of the acidity of urine, by M. H. Joulie. Advantages are claimed for the use of a standard solution of saccharate of lime. No indicator is required, the end-point being shown by the production of a precipitate of phosphate of calcium when the free acid and acid phosphate of sodium have been neutralised.—On the fermentation of cellulose, by M. V. Omelianski. A quantitative study of the action of the ferment described in a previous communication. The products of the decompositions are hydrogen, carbon dioxide, and a large proportion of fatty acids.—Muscular atrophy experimentally produced by pyocyanic intoxination, by MM. Charrin and H. Claude.—On tubercular sclerosis of the pancreas, by M. Paul Carnot.

December 27.—M. A. Chatin in the chair.—In an obituary notice of M. F. Brioschi, whose recent death was announced at the previous meeting, M. Hermite gave a brief account of the work of that distinguished mathematician.—A special method for the absolute determination of declinations and of latitude, by M. Lœwy. A further development of the subject of the author's previous communication.—The centrosomes in vegetable cells, by M. L. Guignard.—On phthalic green. Constitution, by MM. A. Haller and A. Guyot. The colouring matter previously described is to be considered as a substitution derivative of malachite green. The results obtained by Fischer are explained by the presence of impurities in the materials used by him.—Observation of the shower of Orionids, December 12–14, at Athens, by M. D. Eginitis.—On the existence of integrals in orthoic systems, by M. Riquier.—On surfaces applicable to a surface of revolution, by M. A. Pellet.—On linear functional equations, by M. Lémeray.—On a spring ergograph, by MM. A. Binet and N. Vaschilde. Several advantages are claimed for the use of a spring, instead of a weight, in this instrument.—Conductivity of radio-conductors or discontinued electrical conductivity. Resemblance to nervous conductivity, by M. Edouard Branly.—Magnetic properties of tempered steels, by Mme. Sklodowska Curie.—On the polarisation of the light emitted by a sodium flame placed in a magnetic field, by M. A. Cotton.—On the preparation of alloys of beryllium. Alloys of beryllium and copper, by M. P. Lebeau. The alloys are obtained by heating, in an electric furnace, an intimate mixture of oxide of beryllium, oxide of copper, and charcoal.—On the impurities of aluminium and of its alloys, by M. Ed. Defacoz. The author seeks to determine the form in which the foreign elements (silicon, iron, and copper) exist in the metal.—On a double carbonate of sodium and protoxide of chromium, by M. G. Baugé. The new salt results from the action of a solution of sodium carbonate upon chromous acetate in an atmosphere of carbon dioxide. It crystallises with either one or ten molecules of water and is a powerful reducing agent, decomposing water at 100° C. with evolution of hydrogen.—On the atomic weight of cerium, by MM. Wyrouboff and A. Verneuil. A rejoinder to M. Boudouard's criticism.—On the use of carbide of calcium in the preparation of absolute alcohol, by M. P. Yvon. Pure alcohol is without action upon calcium carbide, but the presence of even traces of water leads to the evolution of acetylene and formation of calcium hydrate. It is therefore possible by one, or at most two, distillations to prepare absolute alcohol from spirit of 90 per cent. strength.—On the aromatic diurethanes of piperazine, by MM. P. Cazeneuve and Moreau.—On α-acetylfurfurane and its presence in wood-tar, by M. L. Bouveault.—On the behaviour, on distillation, of a mixture of pyridine with propionic, acetic, and formic acids. The author has studied the progress of fractionation in the case of mixtures of a volatile acid with a feeble base. In the case of pyridine and formic acid the former begins to distil over in a nearly pure state, although its boiling point is 14° higher than that of formic acid.—On crystalline minerals formed under the influence of volatile agents at the expense of the andesites of the island of Thera (Santorin), by M. A. Lacroix.—The theory of the sense of orientation in animals, by M. G. Reynaud.—On the generation of leucocytes in the peritoneum, by M. J. J. Andeer.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 6.

ROYAL INSTITUTION, at 3.—The Principles of the Electric Telegraph: Prof. Oliver Lodge, F.R.S.

FRIDAY, JANUARY 7.

GEOLOGISTS' ASSOCIATION, at 8.—A Brief Account of the Excursions in the Urals, down the Volga, in the Caucasus, &c., made in connection with the International Geological Congress held in Russia, August–September, 1897: L. L. Belinfante.

SATURDAY, JANUARY 8.

ROYAL INSTITUTION, at 3.—The Principles of the Electric Telegraph: Prof. Oliver Lodge, F.R.S.

TUESDAY, JANUARY 11.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Machinery used in the Manufacture of Cordite: E. W. Anderson.

ANTHROPOLOGICAL INSTITUTE, at 8.30.

RÖNTGEN SOCIETY, at 8.30.—Practical Work with the X-Rays: W. Webster.

ROYAL VICTORIA HALL, at 8.30.—Diamonds: Prof H. A. Miers, F.R.S.

THURSDAY, JANUARY 13.

MATHEMATICAL SOCIETY, at 8.—Note on a Property of Pfaffians: H. F. Baker.—On the Stationary Motion of a System of Equal Elastic Spheres of Finite Diameter (continuation): S. H. Burbury, F.R.S.—On Discontinuous Fluid Motion: B. Hopkinson.—On the Intersections of Two Conics of a given Type, and on the Intersections of Two Cubics: H. M. Taylor.—On the Continuous Group defined by any given Group of Finite Order: Prof. W. Burnside, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Presentation of Premiums.—Inaugural Address of the President, Joseph W. Swan, F.R.S.

FRIDAY, JANUARY 14.

ROYAL ASTRONOMICAL SOCIETY, at 8.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Mechanical Draught: R. Gordon Mackay.

MALACOLOGICAL SOCIETY, at 8.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—The Span of Gestation and the Cause of Birth: Dr. J. Beard (Jena, Fischer).—Die Farnkräuter der Erde: Dr. H. Christ (Jena, Fischer).—Lehrbuch der Vergleichenden Mikroskopischen Anatomie der Wirbeltiere: Dr. A. Oppel, Zweiter Teil, Scblund und Darm (Jena, Fischer).—Annuaire de l'Observatoire Municipal de Montsouris, 1898 (Paris, Gauthier-Villars)—Alembic Club Reprints, Nos. 13 and 14 (Edinburgh, Clay).—Imperial University of Japan, Calendar for 1896–97 (Tōkyō).—Sixteenth Annual Report of the Bureau of American Ethnology (Washington).—Knowledge, Vol. xx. (Witherby).—Tables of Parabolic Curves: G. T. Allen (Spon).—Gesammelte Kleine Schriften: L. Rütimeyer, 2 Vols. (Basel, Georg).

PAMPHLETS.—National Association for the Promotion of Technical and Secondary Education, Tenth Annual Report (London).—A New Theory of the Stars: Prof. A. W. Bickerton (Christchurch, N.Z., Whitcombe).—La Planète Vénus: C. Flammarion (Paris, Gauthier-Villars).—Periodic Orbits: Prof. G. H. Darwin.

SERIALS.—Bulletin of the Illinois State Laboratory of Natural History, Vol. 5, Article 3 (Urbana, Ill.).—Humanitarian, January (Hutchinson).—Contemporary Review, January (Isbister).—Maori Art, Part 2: A. Hamilton (Wellington, N.Z.).—Proceedings of the Academy of Natural Sciences of Philadelphia, 1897, Part 2 (Philadelphia).—Fortnightly Review, January (Chapman).—Journal of the Royal Horticultural Society, December (117 Victoria Street).—Journal of the Royal Agricultural Society, Vol. 8, Part 4 (Murray).—Plankton Studies on Lake Mendota, II.: Prof. E. A. Birge (Wisconsin).—National Review, January (Arnold).—Reliquary and Illustrated Archæologist, January (Bemrose).—American Journal of Mathematics, January (Baltimore).

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